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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/828,304	04/05/2001	Julia A. Kornfield	41727/JWP/C766	6585

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EXAMINER	
SADULA, JENNIFER R	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 01/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/828,304	KORNFIELD ET AL.	
	Examiner	Art Unit	
	Jennifer R. Sadula	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-55* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

The following Office Action is a complete response to the amendment and arguments filed 9/25/2003.

Response to Amendment

The amendments have overcome all objections to the specification and have adequately explained the term "sparely cross-linked".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 7-13, 15-19 and 22-55 are rejected under 35 U.S.C. 102(b) as being anticipated by Kubota et al., U.S. Patent No., 6,128,056 ("Kubota").

Kubota teaches a polymer dispersed liquid crystal display element in which a liquid crystal is dispersed in polymer compound and a method of producing such. The polymer resin is in the form of a three dimensional network in a continuous phase of liquid crystal, commonly referred to as a PNLC- or Polymer Network Liquid Crystal. (1:9-44 and 6:6-47). The polymeric compound or liquid crystal droplets are dispersed and held in networks of matrix of three dimensional network form comprising polymer compound (8:65-9:5). Percentages of liquid crystals in the active area are taught in column 12. An electric field can be applied to the

polymer liquid crystal display element by display electrodes being respectively formed on surfaces on the both sides of the liquid crystal composite layer facing the first and second substrates (16:58-62).

Various kinds of liquid crystals that exhibit a liquid crystal state at around ordinary room temperature are taught for use such as nematic, cholesteric and smectic and may be adopted for use singularly or in combination of two or more kinds (22:60-65 and 40:10-19). With regard to claims 26 and 34, the nematic liquid crystals may be twisted nematic (1:16-25). With regard to claim 7, it is inherent that the composite layer have a switching time of less than double the switching time of the liquid crystal molecules in the absence of the polymer as that is the main reason why someone of ordinary skill is inclined to make a PNLC from an LC material.

Furthermore, the resin materials are not limited to the materials taught as long as the resin material has light permeability and is capable of enabling the liquid crystals to be held in the polymer resin matrix after the polymer liquid crystal composite layer is formed. Preferably, UV curable resins may be used such as epoxy base resins and acrylic resins. The heat curable resins that may be used include epoxy base resins and polyester base resins (22:65-23:8). PNM 201 is taught for use with the examples along with different percentages and ratios of liquid crystal to resin. As noted in the examples, with regard to claim 8 Kubota teaches the use of both telechelic and block copolymeric materials.

Claims 1-15, 18-23, 27-33, 35-39, and 41-55 are rejected under 35 U.S.C. 102(b) as being anticipated by Kajiyama et al., European Patent No. 0 501 409 ("Kajiyama").

Kajiyama teaches a liquid crystal display device having a pair of transparent electrodes and a composite film comprising a polymer matrix having a three-dimensional network structure (3:44-47) filled with a liquid crystalline material having high contrast and good heat resistance. The liquid crystal material may be nematic, smectic or cholesteric (4:46-49). With regard to claim 33, the liquid crystals may be energized for alignment purposes.

The polymer matrix is made up of a cross-linked or telechelic material, such as a polyimide resin (abstract) wherein the polymer layer dictates the alignment of the molecules. The polymer molecules may be only cross-linked at the ends. Kajiyama further discloses methods of making devices comprising such a composite material. With regard to claim 7, it is inherent that the composite layer have a switching time of less than double the switching time of the liquid crystal molecules in the absence of the polymer as that is the main reason why someone of ordinary skill is inclined to make a PNLC from an LC material.

The polymer comprises less than 5% of the gel layer by mass and a weight ratio of the polymer to the liquid crystal in the coating liquid is 3:97 to 80:20 (5:56-6:1). Furthermore a weight ratio of the polyamic acid to the liquid crystal is preferably from 2:98 to 80:20 (7:49-50). With regard to claim 4, because the ratio is polymer to liquid crystal and additional components may be added the Examiner interprets this to anticipate the polymer being equal to or less than 2% of the electro-optical layer by mass.

With regard to claim 5, the polymer has a molecular weight of preferably between 100,000 and 5,000,000 (5:15). Specific examples of the polyamic acid raw materials for the polyimide are shown on page 6 to be fluorinated, however the claims are drawn toward the polyimide being a fluorinated polyimide resin.

Claims 1-25, 27-33, and 35-55 are rejected under 35 U.S.C. 102(b) as being anticipated by Toshida et al., U.S. Patent No., 5,812,227 ("Toshida").

Toshida teaches a liquid crystal display device comprising a three dimensional network structure coated with a polymer layer and a low-molecular weight mesomorphic compound impregnating the three dimensional network structure (abstract). The device comprises a pair of electrode plates each comprising a substrate and an electrode thereon and a display layer disposed between the electrode plates wherein the display layer is formed by impregnating a porous polymer material with a low molecular weight mesomorphic polymer or with a three dimensional network coated structure (3:15-31). Each of the substrates may comprise glass or plastic in the form of a plate or film (4:35-37). The electrodes formed on the substrates may be transparent (4:58-64). The porous polymer material may be fluorinated (5:23-42) (i.e. polychlorotrifluoroethylene) and a method of filling the material may include a polymerization including heat or UV rays (6:12-22). Preferably the material is photopolymerizable (19:29-41). The material may have a molecular weight above 1,000,000 (see examples, i.e. example 5).

The liquid crystals may be nematic, isotropic, chiral smectic, etc (8:4-28), however a nematic compound having a positive dielectric anisotropy is preferred (17:17-20). With regard to claim 33, the liquid crystals may be energized for alignment purposes. With regard to claim 7, it is inherent that the composite layer have a switching time of less than double the switching time of the liquid crystal molecules in the absence of the polymer as that is the main reason why someone of ordinary skill is inclined to make a PNLC from an LC material.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 26 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kajiyama or Toshida, as applied above, in view of Kubota.

Kajiyama and Toshida both teach the polymer dispersed liquid crystalline composite layers or polymer network liquid crystalline composite layers as specified. Both references further teach that the liquid crystals selected may be nematic liquid crystals, however neither reference is specific to utilizing a twisted nematic (TN) liquid crystal in a PDLC or PNLC composite.

Kubota teaches a polymer dispersed liquid crystal display element in which a liquid crystal is dispersed in polymer compound and a method of producing such. The polymer resin is in the form of a three dimensional network in a continuous phase of liquid crystal, commonly referred to as a PNLC- or Polymer Network Liquid Crystal. (1:9-44 and 6:6-47). The polymeric compound or liquid crystal droplets are dispersed and held in networks of matrix of three dimensional network form comprising polymer compound (8:65-9:5). Various kinds of liquid crystals that exhibit a liquid crystal state at around ordinary room temperature are taught for use such as nematic, cholesteric and smectic and may be adopted for use singularly or in combination of two or more kinds (22:60-65 and 40:10-19), however the nematic liquid crystals

may be twisted nematic (1:16-25) thereby imposing a high light availability efficiency which is desirable.

It would have been obvious to one of ordinary skill in the art at the time of invention to make either device of Kajiyama or Toshida utilizing their own composite materials with the TN liquid crystals of Kubota as Kubota teaches them for use in the same capacity yet the TN materials provide for higher light availability efficiency.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kubota, as applied above, in view of Kajiyama.

Kubota teaches the polymer dispersed liquid crystalline composite layers or polymer network liquid crystalline composite layers as specified. Both references further teach that the liquid crystals selected may be nematic liquid crystals, however neither reference is specific to utilizing a twisted nematic (TN) liquid crystal in a PDLC or PNLC composite. The resin materials are not limited to the materials taught as long as the resin material has light permeability and is capable of enabling the liquid crystals to be held in the polymer resin matrix after the polymer liquid crystal composite layer is formed. Preferably, UV curable resins may be used such as epoxy base resins and acrylic resins. The heat curable resins that may be used include epoxy base resins and polyester base resins (22:65-23:8).

Kajiyama teaches a liquid crystal display device having a pair of transparent electrodes and a composite film comprising a polymer matrix having a three-dimensional network structure (3:44-47) filled with a liquid crystalline material having high contrast and good heat resistance. The liquid crystal material may be nematic, smectic or cholesteric (4:46-49). The polymer has a

molecular weight of preferably between 100,000 and 5,000,000 (5:15). Specific examples of the polyamic acid raw materials for the polyimide are shown on page 6 to be fluorinated, however the claims are drawn toward the polyimide being a fluorinated polyimide resin.

It would have been obvious to one of ordinary skill in the art at the time of invention to make the device of Kubota with the resin material of Kajiyama as Kubota teaches the resin to be capable of resin material has light permeability and is capable of enabling the liquid crystals to be held in the polymer resin matrix after the polymer liquid crystal composite layer is formed and Kajiyama teaches that the fluorinated polymers serve such a purpose and are UV curable or heat curable as specified by Kubota.

Response to Arguments

Applicant's arguments filed 9/25/2003 have been fully considered but they are not persuasive. Applicants claim in claim 1 an electro-optically active gel layer having certain properties comprising a "quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogeneously dispersed therein, wherein the polymer network comprises a plurality of sparsely cross-linked polymer molecules" (emphasis added). Similar language is found in Applicants' independent claims 27, 29, 43 and 46.

Applicants allege that the patentable distinction between their invention and the prior art lies in the homogeneously dispersed polymer within the aligned liquid crystal molecules. Examiner has not followed Applicants' line of reasoning concluding in the references not teaching such. Specifically, Applicants draw our attention to Kubota teaching a percentage of liquid crystal in the non-active area and a percentage of the liquid crystal in the active area are so

formed as to be different from each other (emphasis added). The Applicants claims are drawn toward that "quantity" of homogenously dispersed material... but not all of the Applicants material is homogeneous, thereby granting the material as "heterogeneous" and not limited from being somewhat heterogeneous in nature.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Takatoh et al. teaches an LCD including a gel of a polymer dispersed liquid crystal material.

Kumar teaches the liquid crystal molecules in the absence of the polymer composite layer have a switching time of more than half the switching time of as that is the main reason why someone of ordinary skill is inclined to make a PNLC from an LC material.

Li et al. teaches a bistable liquid crystal display device utilizing polymeric stabilization wherein the device has low power consumption and faster switching times.

Nakao et al. teaches a polymer dispersion type liquid crystal display element comprising a PDLC composite as specified for excellent threshold characteristics and scattering.

Kuo et al teaches a low color dispersion liquid crystal display wherein the polymer network modifies the electrooptical characteristic of the LCD.

Park et al teaches a polymeric liquid crystal emulsion including a liquid crystal and a water-soluble copolymer obtained by polymerizing a hydrophobic monomer with one or more hydrophobic monomers.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer R. Sadula whose telephone number is 571.272.1391. The examiner can normally be reached on Monday through Friday, 10am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff can be reached on 571.272.1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.308.0661.

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

JRS
January 5, 2004